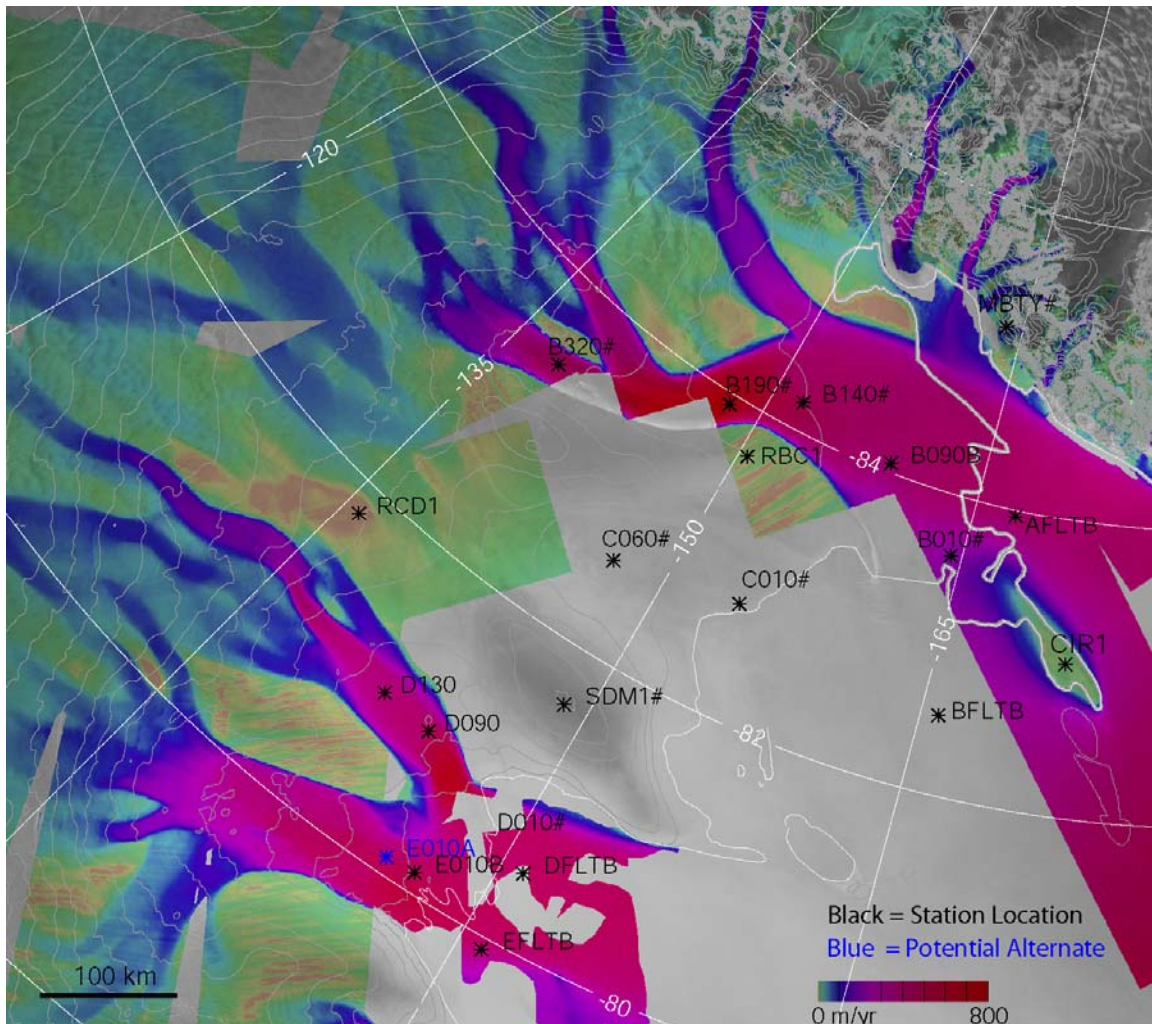


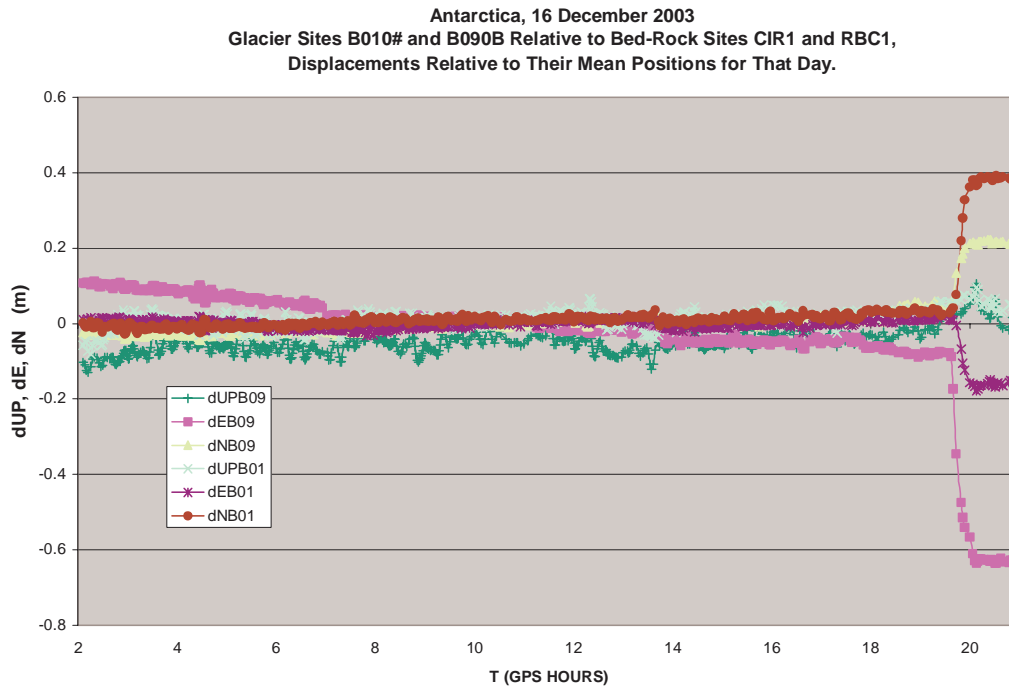
## WEST ANTARCTIC ICE STREAM STOP-AND-GO MOTION

During a 2-week campaign in the austral summer of 1999, data were collected with several GPS receivers deployed on an ice stream and on bedrock, the latter used as interferometric references to determine with high precision the movement of the ice at the points occupied by the former. This was part of ongoing studies of the changes in the rate of flow of glaciers and ice streams in Antarctica, with the main goal of establishing the net trend in ice transport to the sea. The figure below show the location of the various receivers.



The movement of this particular ice stream is characterized by periods of very slow creep, followed by sudden slips forward that repeat twice daily, and appear to be triggered by the ocean tide where the ice reaches the sea. The sudden movement seems to be caused by the extra tidal push taking the soil at the base of the glacier, already stressed by the weight and push of the mass of ice, past its breaking point. The resulting slip propagates very fast, starting at the ice front on the sea and running upstream, so the farthest points occupied by GPS receivers begin to move a few minutes after the ones closest to the sea.

The figure below shows the result of a kinematic solution in which the trajectories of two points on the ice have been determined simultaneously. Plotted are the changes in instantaneous position, relative to each receiver's mean position for the whole period. This solution was made using the "IT" software developed by Oscar L. Colombo. The GPS data were kindly provided by Dr. Matt King, of Newcastle University, in the UK. Shown are the vertical (dUP), North (dN) and East (dE) displacements of the ice during the quiet and the slip phases. Each mark indicates one minute of elapsed time. The vertical movements are very small compared to the horizontal.



## REFERENCE

Bindschadler, R., M. A. King, R. B. Alley, S. Anandakrishnan, L. Padman, "Tidally Controlled Stick-Slip Discharge of a West Antarctic Ice Stream", *Science*, Vol. 301, pp. 1087-1089, 22 August 2003.